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OHIO NORTHERN UNIVERSITY BULLETIN

ADA, OHIO

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This Bulletin contains information concerning the

COLLEGE OF ENGINEERING

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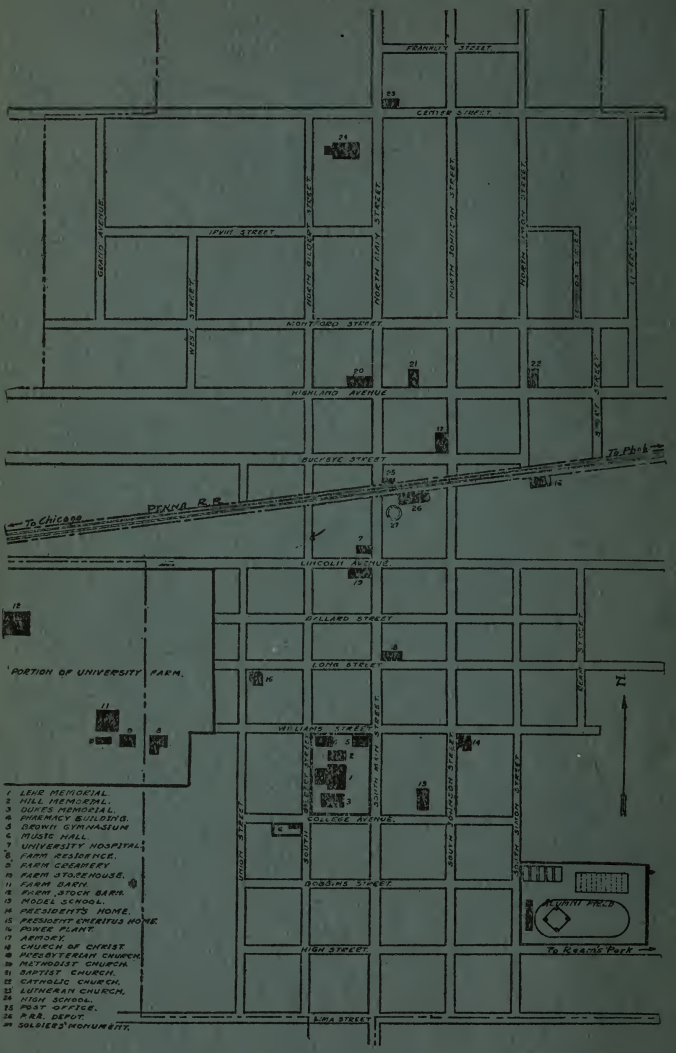
CALENDAR

Fall Quarter.....Sept. 7, 1920
Winter Quarter...Nov. 30, 1920
Spring Quarter..March 1, 1921
Summer Quarter..May 31, 1921



ADA AND THE O. N. U.

ADMINISTRATIVE OFFICERS

ALBERT EDWIN SMITH, D. D., Ph. D.,
President

JOHN DAVISON, M. S., PED. D.,
Vice President

THOMAS J. SMULL, B. S., C. E.,
Executive Secretary

MRS. MARGARET WHITWORTH
Registrar

COLLEGE OF ENGINEERING

FACULTY

CHARLES ADDISON MILLER, C. E.,
Dean
Civil Engineering

GUY HERBERT ELBIN, C. E.,
Municipal Engineering

JOHN ALFRED NEEDY, B. S., M. E.,
Mechanical Engineering

FLOYD FRED TURNER, E. E.,
Electrical Engineering

LENIX CRAIG SLEESMAN, Ph. G., Ph. C.,
Chemical Engineering

WHITMAN S. BECKWITH, A. M.,
Higher Mathematics

MRS. MARGARET E. WHITWORTH, B. S.,
Mathematics

FRANK LEWIS BERGER, A. B.,
Physics

HARVEY EVERT HUBER, A. M.,
Geology and Mineralogy

WILLIAM CLAUDIUS GROTH, A. M.,
Modern Languages

CHILDE HAROLD FREEMAN, B. S.,
English

WILLIAM HENRY TRAINUM, A. M., B. D.,
Economics

JAMES NYE, LL. B.,
Contracts

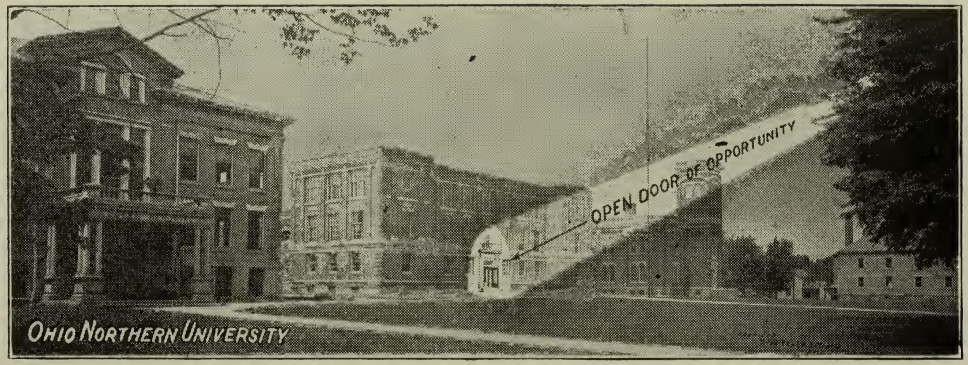
ARTHUR RAYMOND STEESE, B. S. in C. E.
Assistant in Mathematics

CARL SELPIEN, B. S. in E. E.,
Assistant in Electrical Laboratory

RUFUS DANIEL PUGH, B. S. in C. E.
Assistant in Surveying

LEON C. HECOX, B. S. in M. E.
Assistant in Mechanical Laboratory

ERIC D. LANE, B. S. in C. E.
Assistant in Drawing



A ROW OF NEW BUILDINGS

The Ohio Northern University has fine, new, up-to-date buildings:

The Dukes Memorial with commodious class rooms, offices, and laboratories, devoted to science, mathematics, engineering and agriculture.

The Lehr Memorial in which is located the executive offices, the Y. M. and Y. W. C. A. rooms, the library with reading and research rooms, the apartments of the College of Commerce, College of Law, and a magnificent auditorium seating 1500 people

The Hill Memorial contains ten recitation rooms two literary societies, electrical and mechanical laboratories, and the central heating and lighting plant. In this new and magnificent building is the department of language, history, philosophy, and School of Education.

The Music Hall, nearly new, has assembly room, studios, offices and many private practice rooms.

The Pharmacy Building, recently remodeled with large laboratories, recitation rooms and Adelphian Literary society, is an attractive and valuable building.

The Brown Memorial, fitted up for a gymnasium and equipped in first-class shape for indoor athletics and military drill.

OHIO NORTHERN UNIVERSITY BULLETIN

New Series ADA, OHIO, APRIL, 1920 Vol. XII., No. 11

COLLEGE OF ENGINEERING

Charles A. Miller, Dean

The College of Engineering of Ohio Northern University occupies a unique place among the great educational institutions of America; because it is pre-eminently for the student of moderate means. The courses have been recently revised in order to cope with the great demands for the re-construction period. This is emphatically the peoples college and a student is given large liberty both with respect to the choice of studies and with respect to the amount of work undertaken. This school is cosmopolitan. Everybody is admitted on the basis of character, without written examination.

In almost every community, in almost every rural district, there are young men (and women also) who are devoting their time to manual labor, who through economy, have laid by a little money. They look about them and observe the advantages of an education. In earlier years they failed to use their opportunity for obtaining an education. They would now enter some school and begin at the bottom and work up if they were confident that such a school could be found. A school where they would not feel embarrassed by being forced to recite with more educated students.

No school in America has done more for this backward class than ours. Nor is our attendance confined to local patronage. The New England and Middle States with their rich resources and great demand for engineers, have contributed hundreds of students to our classes; and this is true to somewhat less extent of every state in the **union,** also many have come from **foreign lands.**

The aim of the department is to lay a foundation of sound theory, and at the same time to impart such knowledge of the usual professional practice as shall make its students useful in any position to which they may be called.

Class room and public lectures of special interest to engineers are given from time to time by the leading consulting engineers of this vicinity. Our engineering students are strongly advised to devote their vacations to surveying, drafting, work in factories, repair shops, electric light and railway stations, and similar work, in order to obtain commercial experience and a better appreciation of the relation of technical training to practical work.

The success of the course of training offered by the college is testified to by the very large per cent of the graduates who are engaged in occupations connected with engineering.

IT MAY INTEREST YOU TO KNOW THAT

The technical branches are under the direct care of those who have had professional experience as well as a full scientific training.

? ? ? ? ? ? ?

Are you satisfied with your present position?
Are you making from $150 to $350 per month?
Are your chances for advancement satisfactory?
If not, read this circular carefully.

OUR MOTTO

"We aim to give to students what they want, when they want it."

EXPENSES

On account of the large number of students attending school at the Ohio Northern University, the cost of living has been reduced to a minimum. Tuition for a term of

twelve weeks is $25.00. Good board in private families can be obtained at prices ranging from $4.00 to $5.00 per week, and a well-furnished room at from $1.25 to $2.00 per week. Ada is a school town, and the majority of the families are engaged in boarding and rooming students. The competition is sharp; hence prices are low and board is good. Everything considered, we do not believe this can be equaled by any school in the United States.

Some schools advertise **free tuition,** but it will be found that **entrance** fees with them amount to more than tuition fees here, a fact not to be overlooked by those selecting a school, thorough, yet inexpensive.

There is no registration or matriculation fee required.

A nominal fee is required for laboratory and field work, also a small "student activity" fee.

TIME TO ENTER

The large number of classes formed each term makes it possible for a person to enter at almost any time during the year and find the work he wishes. The best time to enter, however, is at the beginning of a quarter. See calendar.

In view of the fact that we present nearly every branch of study in the College of Engineering from two to four times a year, we claim the right to make the above assertion.

Note—See general catalogue for further advantages.

TIME REQUIRED

The object of the founders of the Engineering School of the Ohio Northern University was to provide a school which would be able to furnish an engineering education with the least possible expenditure of time and money. In looking around for a solution of this problem it was found that about three-eighths of the time alloted to the Engineering Course in other technical schools was devoted to the study of subjects which have no direct bearing upon engineering, and it was found by dropping these subjects **the time could be shortened to about two and one-half years, of 48 weeks each.**

In this connection we wish to state that we have shortened our courses by throwing out such subjects as French,

Greek, German, Zoology, etc., which have no direct bearing on engineering.

By doing this we have placed an engineering degree within reach of thousands of worthy young men whose time and means will not permit them to spend the long period of four years in preparation for a profession.

In thus reducing the length of our courses we have called upon ourselves the censure of many technical schools throughout the United States who claim a thorough knowledge of engineering can only be obtained by a long college course.

In refutation of this censure permit us to make a comparison of the total number of credit hours required for graduation with those of other technical institutions. As a concrete example we will look at the calendar of one of the most prominent technical schools in the land **for the year 1919-20.**

Registration days, _____Monday, Tuesday, Oct. 1-2
Thanksgiving vacation _____ Nov. 28 to Dec. 3
Christmas vacation _____ Dec. 21 to Jan. 1
Easter vacation _____ March 29 to April 7
Semester examinations close _____ May 23
School year _____32 weeks
Four year course _____ 128 weeks
Class exercises _____ 18¼ hrs. per week
Full course _____ 2336 hours
Less 150 hours credit for Thesis _____2186

Now let us look at our calendar for the same years.

Registration day _____Tuesday, Sept. 11
Christmas vacation _____ Dec. 21 to Jan. 1
School year closes _____ Friday, Aug. 9
School year (actual operation) _____ 48 weeks
Ten quarter course _____ 120 weeks
Class exercises _____ 20 hrs. per week
Full course (required) _____ 2400 hours
*All graduates required to prepare a thesis, exclusive of above 2400 hours.

By careful study of above table you will note the first institution requires 2186 hours of actual work as compared to 2400 hours required by us. Since we have dropped some of the secondary subjects as heretofore mentioned, it is

a well-established fact that we give more technical training, hour for hour, than 90 per cent of all other technical schools.

We do not want to be understood as finding fault with these apparent long courses, which in addition to a thorough scientific training, carry with them the benefits of classical culture; and to accommodate those who may thus wish to broaden their education, the excellent instruction of the Classical and Literary departments of the University are **thrown open to all engineering students, free of extra tuition.** A maximum of nine (9) **credit hours** will be allowed for advanced English or other modern languages.

ADMISSION

Applicants for admission to courses in the College of Engineering, leading to a degree, must be graduates of a first grade high school or its equivalent. Those not desiring to earn a degree may enter any department and pursue the studies they choose, if on consultation, the head of the department is satisfied that they have sufficient preparation to pursue the work successfully. Such applicants are classified as special students. Should they later desire to graduate they may do so on condition of passing all the requirements including the preparatory work which may be taken in our **Preparatory School.**

ADMISSION WITH ADVANCED STANDING

A liberal policy is pursued in giving credit for work done in other colleges. Some credit is given for practical experience in draughting and field work acquired previous to matriculation, upon receipt of a satisfactory statement from the employer, stating the nature of the work and length of service. Statements must include **Postoffice address** as well as **signature of employer.**

OPTIONS

With the advice and consent of the Professor-in-charge, certain subjects can be elected in any of the regularly scheduled courses, or "special organized classes" to replace such as may not appeal to the student in his chosen course. These are termed options.

DEGREES

The University is empowered to grant the customary scholastic degrees, which in the College of Engineering, are Bachelor of Science, (B. S.), Civil Engineer (B. S. in C. E.),

Mechanical Engineer, (B. S. in M. E.), Electrical Engineer, (B. S. in E. E.), Chemical Engineer, (B. S. in Chem. E.) and also those of Municipal Engineer, Sanitary Engineer and Architect, but aims to bestow them on the deserving only. Two years after graduation, upon presentation of creditable record and approved thesis the regulation degree will be conferred. Such honors are not for sale, but must be earned and merited. The management accepts grade of equal value from other institutions of learning, yet the applicant for a degree is required to do a reasonable portion of his work here. No diploma is granted on grades made wholly in other institutions. **No student carrying more than two subjects will** be excused from the final examination during the senior term.

Two hundred (200) credit hours required for graduation.

Two (2) hours field or laboratory work constitute one credit hour.

Every candidate for a degree must prepare a thesis upon some technical or scientific study, which lies within the field of the degrees sought, and may either be designing, construction, testing, or research. The same to be selected with the approval of the Professor-in-charge.

The form of the finished thesis must be in accordance with the requirements of the department and the library.

No certificate of graduation will be issued less than **twenty-four weeks** after announcement of subject or less than **four weeks** after deposit of finished thesis with the Dean.

SEMINAR

Weekly conferences on current engineering events and discussion of engineering papers are held. It shall be the aim of those in charge to have critical study of senior theses made at this time.

STUDENTS TECHNICAL ORGANIZATIONS

The Ohio Northern Society of Engineers holds weekly meetings. At the meeting papers are read and discussions given on subjects of interest to all engineering students. A number of addresses by practicing engineers are made before the Society during the school year. All engineering students are eligible to membership in this society.

The Ohio Northern University Branch of the American

Institute of Electrical Engineers holds bi-monthly meetings. At these meetings original papers and papers printed in the Proceedings of the American Institute of Electrical Engineers are read and discussed. All students interested in electrical engineering are eligible to membership in this society.

The Ohio Northern Chapter of the American Association of Engineers holds bi-monthly meetings. All Engineering students are eligible. Proceedings of the American Association of Engineers are received and discussed. In honor of George Washington, "Surveyor, Soldier, Statesman," the above societies devote the week of February 22 to a series of Technical Lectures, Annual Exhibit, Annual Banquet, etc.

Among the visiting lecturers of the past year were found: Mr. Cecil Rood, President of the Ohio Engineering Society, Toledo, Ohio; Mr. John R. Allen, Former Dean of the College of Engineering, University of Minnesota, Pittsburg, Pa.; Mr. B. A. Gramm, Vice President and General Manager Gramm Bernstein Motor Co., Lima, Ohio; Mr. Walter V. Scott, District Engineer, Portland Cement Association, Bellefontaine, Ohio; Mr. W. P. Burpee, Rep. Canadian Pacific R. R., Cleveland, Ohio; Mr. C. W. Collins, Rep. the Barret Co., Cleveland, Ohio; and others of high standing in the engineering profession.

GOVERNMENT

The University publishes no stereotyped rules of conduct for its patrons. Each student is placed upon his honor. While students are assisted in forming correct habits, this is not a reform school. Persons who cannot govern themselves are not wanted. The opportunities and advantages of the University are offered to all who earnestly desire to develop the best there is in them and wish to fit themselves for usefulness. All are treated as ladies and gentlemen until they prove themselves otherwise. Regular attendance in classes and thoroughness of work insisted upon. Incorrigible and morally corrupt persons are dismissed from the University.

All students will be received or dismissed at the discretion of the President and Administrative Committee.

1. A student cannot be a candidate for more than one professional degree at the same time.

2. A candidate for a degree must comply with all requirements in force at the time said degree is conferred.

3. A student will be permitted to substitute one subject for another as outlined under the subject of options.

4. Final examinations will be held on Wednesday and Thursday of the twelfth week of each quarter. Mid-term examinations are also held at the end of the sixth week of each quarter.

5. Special examinations for students debarred or deficient at regular examinations are also held the last Tuesday of each quarter. A fee of $2.50 for each subject will be exacted.

6. The following method of grading is in effect: Ex., G, Av., P, Cn., F.

7. Any student being given a grade Cn. will be "conditioned" and be required to take the next regular examination in that subject. In case the subject is not repeated during the school year he will be given the opportunity of a special examination as provided under Section 5.

8. Failing to pass the second examination or having received a grade F at the first examination, he must repeat the subject with the next class. Failing a third time under the first condition, or the second time under the second condition, to pass a satisfactory examination, he shall be dropped from the roll of the school.

9. Before entering on any study the student must give the Dean satisfactory evidence that he is prepared to pursue it with advantage.

10. The Dean requires a student to drop a part of his work at any time, if in his opinion he is undertaking too much; or to take additional work, if he thinks he is not sufficiently employed.

11. No credit will be allowed a student for work in any course, unless the election of the work is formally entered on his classification blank before the work is done.

12. After matriculation a student can not without special permission of the Dean be admitted to examination in any of the courses given until he has received in the University the regular instruction in such course.

13. Fifteen recitation hours per week is the minimum permitted, while twenty-three is the maximum permitted. Should the Dean grant the privilege of carrying more hours it will be accompanied by **Extra Tuition.**

STUDENT HELP

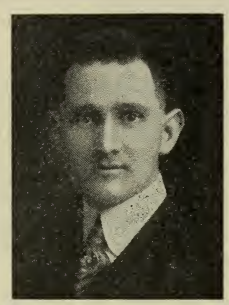
The Board of Education of the M. E. Church lends money to those who are taking a course in school and have been in attendance long enough to merit a recommendation from the faculty. No interest is charged for two years from date of graduation, and no security is required further than a recommendation from a quarterly conference and from the faculty. Many of our students avail themselves of this advantage.

For further information, address Prof. H. Whitworth, Ada, Ohio, who has charge of this fund.

R. O. T. C. BAND

There is also an Employment Bureau conducted by the Y. M. C. A., whereby many of our students make their entire expenses working as waiters, janitors, and other occupations in town and nearby, being able at the same time to carry on their studies in full work. There is no reason why any ambitious and capable young man or woman desiring an education, should not obtain it at the Ohio Northern University.

CIVIL ENGINEERING



Prof. G. H. Elbin

This is the parent stem of engineering pursuits, and in its broader sense includes all branches of surveying and engineering construction. Many of its former departments have grown into separate professions, yet there still remains a broad and important field, offering larger opportunities that ever before. Besides the basic science common to all branches of engineering (mathematics, physics, chemistry, astronomy and mechanics) the technical instruction includes drawing, surveying, railroad engineering, strength of materials, roofs, bridges, foundations, arches, retaining walls, dams, waterworks, river and harbor improvements, sewerage, drainage, hydraulics, waterpower and geodesy.

The method of teaching is by means of class room exercises, field work, practical drawing and designing. Much time is devoted to the study of steel and concrete construction, during which the student is made familiar with the computation of stresses, designing, detailing and drawing of roofs, bridges and steel and concrete construction of all kinds. The subjects of Roads and Pavements, Railroad Construction and Maintenance, and Masonry Construction are exhaustively treated. Special attention is given to Topographical, Stadia and City Surveying and Leveling. We aim to fit men to act as county and city engineers, surveyors, highway engineers, hydraulic engineers and government geodetic engineers.

Besides the regular undergraduate work, special and more elaborate work will be given to those wishing to prepare for special positions.

Practically all local improvements are under the direct supervision of the College of Engineering. Many thousands of dollars have been expended the past few years for street paving, macadamizing, sewerage, etc., the major portion of the engineering work being done by the students themselves. During the present year an extensive sewer system, together with considerable street improvement is being projected and will thus give the student an opportunity of getting an insight into real engineering practice, which combined with theoretical instruction presents unexcelled opportunity for advancement.

EQUIPMENT

Our equipment is second to none being composed of high-grade transits, levels, sextant, compasses, plane tables, level rods, chains, tapes, axes, pins, railroad curves, plainimeters, protractors, stereotomy and descriptive geometry models, a collection of photographs and shop drawings of bridges and buildings, a large modern drawing room, equipped with individual lockers, **hydraulic, cement, and testing laboratories,** a complete **electrical blue printing outfit** and filing cases by which the student is familiarized with modern office methods, projectoscope and numerous engineering slides, and an excellent scientific library. This equipment is constantly being added to by purchase and donation and by construction of students of the College of Engineering.

The following is a schedule of the course offered, showing the number of credit hours per week devoted to each subject:

FIRST QUARTER

College Algebra I.	4.
Trigonometry I.	5
Mech. Drawing I.	4
Physics IV.	5
Est. and Contracts	2½

THIRD QUARTER

College Algebra III.	4
Calculus I.	4
Mech. Drawing III.	4
Chemistry III.	5
Analytical Geometry II.	3

FIFTH QUARTER

Masonry	4
Calculus III.	4
Desc. Geometry II.	4
Physics VI.	5
Field Engineering	5

SEVENTH QUARTER

Mechanics of Materials II.	5
Stresses I.	5
Graphics I.	4
R. R. Economics and Design	5

NINTH QUARTER

Least Squares	2½
Higher Structures	5
Bridge Design I.	5
Hydraulics II.	3
Hydraulic Lab.	2
Highway Engineering	2½
Cement Testing	1

SECOND QUARTER

College Algebra II.	4
Trigonometry II.	2½
Mech. Drawing II.	4
Chemistry II.	5
Analytical Geometry I.	5

FOURTH QUARTER

Astronomy	4
Calculus II.	4
Desc. Geometry I.	4
Physics V.	4
Plane Surveying	5

SIXTH QUARTER

Masonry Design	3
Mechanics of Materials I.	5
Analytical Mech.	5
Field Astronomy	2½
Rail Road Survey	5

EIGHTH QUARTER

Geology	3
Stresses II.	5
Graphics II.	4
Hydraulics I.	5
Sewerage	2½

TENTH QUARTER

Geodesy	2½
Mill Buildings	3
Bridge Design II.	5
Re-in. Concrete	3
Electric Rys.	2½
Seminar	1
THESIS	

ELECTRICAL ENGINEERING

Prof. F. F. Turner

The courses offered in this branch of Engineering require a thorough study of theoretical and applied electricity. The first half of the prescribed study is, in the main, the same as that in the Civil and Mechanical Engineering curriculum, including the fundamental engineering sciences, mathematics, drawing and surveying.

The second half consists of courses of study in stresses, strength of materials, hydraulics, steam engines, advanced study in the theory of electricity, a large amount of laboratory research and experiment, shop tests, machine drafting and designing, power plant and wiring layouts, and a thorough course in electrical machine construction.

The theoretical work is thoroughly supplemented with practical application in the laboratory and in the design of electrical machinery. Throughout the course the student is drilled in the solution of many numerical problems with a view to a firm grasp of the theory.

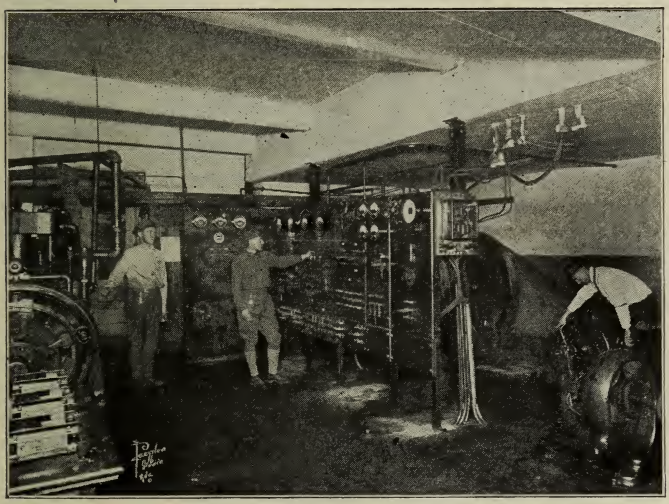
EQUIPMENT

In addition to an excellent Physical Laboratory, the department has a well equipped Electrical Laboratory. An up-to-date oil engine driven Electric lighting system has been installed for lighting the University buildings and grounds, and for driving the ventilating motors in the various buildings.

The University power plant comprises one gas engine unit and semi-Diesel oil unit. To prevent interruption to the service, storage batteries have been installed. These batteries are available for test and form an important addition to the laboratory equipment.

In the laboratory, both direct and alternating currents may be used for testing purposes. The many additions made recently to the laboratory equipment, and the enlargement of the laboratory, have made it possible to accommodate a

large number of students. In addition, the machine shop with its complement of lathes and drill presses and other tools constitutes a valuable acquisition for the department. As a part of the electrical equipment the following may be mentioned: A General Electric three phase generator; a control panel with suitable switches and circuit breakers, meters, etc; a testing panel for the measuring of resistance, or testing of three phase apparatus, a feeder panel for the control of the A. C. and D. C. testing circuits, a five panel switchboard for controlling the D. C. generators, motor generator sets and storage batteries, equipped with necessary meters, switches,



ELECTRICAL LABORATORY

circuit breakers, etc.; a large number of D. C. motors and generators representing the product of seven different manufacturing companies, including an interpole motor of the latest construction; several transformers; Westinghouse, Reliance, Wagner and Emerson induction motors, both three phase and single phase; induction coils; storage batteries of

several different types; X-Ray apparatus; frequency meters; galvanometers; bridges, rheostats; watthour meters; prony-brakes and about forty voltmeters, ammeters and wattmeters, representing nearly all the best known makes of instruments. In addition to the above, the department has recently acquired two direct current generators, a twenty-five K. W. General Electric and a fifteen K. W. Westinghouse. The department is well supplied with all the necessary equipment for the conducting of first class laboratory work. The study of Alternating Currents is made very clear by the use of a lecture room oscillograph.

The following is a schedule of the course offered, showing the number of credit hours per week devoted to each subject:

FIRST QUARTER

Mech. Drawing I.	4
Physics IV.	5
College Algebra I.	4
Trigonometry I.	5
Est. and Cont.	2½

THIRD QUARTER

Mech. Drawing III.	4
El. Elec. Mach. I	5
College Algebra III.	4
Calculus I	4
Anal. Geometry II.	3

FIFTH QUARTER

Mach. Design I.	4
Elec. Mach. II.	4
Elec. Mach. IV.	4
Calculus III.	4
Chemistry III.	5

SEVENTH QUARTER

Thermo. I.	5
El. Elec. Mech. II	5
Mech. Materials II.	5
Stresses I.	5

NINTH QUARTER

Elec. Mach. VI.	5
Elec. Mach. VII.	5
Hydraulics II	3
Hydraulic Lab.	2
Steam Turbines	5

SECOND QUARTER

Mech. Drawing II.	4
Physics VI.	5
College Algebra II.	4
Trigonometry II.	2½
Anal. Geometry I.	5

FOURTH QUARTER

Mach. Drawing	4
Elec. Mach. I.	5
Physics V.	4
Calculus II.	4
Chemistry II.	5

SIXTH QUARTER

Mach. Design II.	4
Elec. Mach. III.	5
Mech. Materials I.	5
Desc. Geometry I.	4
Anal. Mech.	5

EIGHTH QUARTER

Elec. Mach. V.	5
Telephone Engineering	4
Hydraulics I.	5
Plane Surveying	5
Seminar	1

TENTH QUARTER

Elec. Rys.	2½
Elec. Circuits	2½
Adv. A. C.	5
Elec. Mach. IX.a	4
Elec. Mach. IX.b	4
THESIS	

MECHANICAL ENGINEERING

Prof. J. A. Needy

Mechanical Engineering deals with the transformation and transmission of energy, and with the theory, design, and construction of mechanism and machinery. The courses offered are selected with a view to the theoretical and practical training that will enable the student to cope with the intricate and complicated problems arising in this important phase of engineering. The first half of the curriculum consists of the basic engineering studies. In the latter half an exhaustive study is made of all phases of heat engineering, together with the design, erection, and maintenance of power plant apparatus.

Thorough training is given in machine drafting, machine designs, thermodynamics, steam engines, heating and ventilating, steam boilers, refrigeration, gas engines, electrical machinery, and steam power plants.

EQUIPMENT

The University has its own gas-engine-driven lighting plant and a central steam heating plant, lighting and heating all the University buildings. This equipment is installed with special conveniences for making tests on boilers, heating apparatus and power apparatus. In addition the central heating and lighting plant of the Ada Heating and Light Co., with its equipment of Corliss engines, high pressure cold and hot water pumps, et cetera, is open to the students for inspection and test.

A well equipped machine shop has been added recently to the laboratory equipment, thus giving the student excellent training in the use of tools and general machine shop practice.

The University, because of increasing power demands, contemplates building in the near future a modern power plant equipped with oil and gas engines of the latest types,

with a view to making it a part of the mechanical laboratory, in which tests for efficiency and fuel consumption may be easily and quickly made. The work of installing will be done

MECHANICAL LABORATORY

largely by student help, who thus will get practical experience in moving and erecting engines, switch boards, storage batteries, etcetera. Since the plant will be operated by student help, additional practical experience will be gained.

The following is a schedule of the course offered, showing the number of credit hours per week devoted to each subject:

FIRST QUARTER

Mech. Drawing I.	4
Physics V.	4
College Algebra I.	4
Trigonometry I.	5
Estimates and contracts	2½

THIRD QUARTER

Mech. Drawing III.	4
Analytical Geometry II.	3
Physics IV.	5
College Algebra III.	4
Calculus I.	4

FIFTH QUARTER

Thermodynamics II.	5
Metallurgy	2½
Chemistry III.	5
Calculus III.	4
Machine Design I.	4

SECOND QUARTER

Mech. Drawing II.	4
Analytical Geometry I.	5
Physics VI.	5
College Algebra II.	4
Trigonometry II.	2½

FOURTH QUARTER

Thermodynamics I.	5
Elem. Elect. Mach. I.	5
Chemistry II.	5
Calculus II.	4
Machine Drawing	4

SIXTH QUARTER

Machine Design II.	4
Mech. of Materials I.	4
Descriptive Geometry I.	4
Analytical Mech.	5

SEVENTH QUARTER

Elem. Elect. Mach. II.	5
Mech. of Materials II.	5
Descriptive Geometry II.	4
Refrigeration	4
Machine Design III.	4

NINTH QUARTER

Steam Turbines	4
Stresses I.	5
Gas Engines	4
Mechanical Lab. I.	4

EIGHTH QUARTER

Machine shop	4
Heating and Ventilating	4
Hydraulics I.	5
Plane Surveying I.	5
Steam Power Plants	4

TENTH QUARTER

Valve Gears	4
Steam Engine Design	4
Seminar I.	1
Steam Boilers	4
Gas. Engine Design	4
Mechanical Lab. II.	4
THESIS	

MUNICIPAL AND SANITARY ENGINEERING

This branch of engineering is probably more nearly related than any other to the parent stem, civil engineering. The instruction consists of the basic engineering sciences, and most of the general civil engineering subjects, special attention being paid to those branches which have to do with the public health. This calls for a better knowledge of

CEMENT LABORATORY

chemistry, bacteriology and sanitation than can be obtained in the usual courses in civil engineering, and additional work is given in topographic surveying, water supply, sewer design, sewage disposal, roads and pavements and precise surveying.

At no time in the history of all countries has there been **a greater demand for improved highways.** Comparatively

few men of this country have given the matter of highway construction the study which the subject deserves and it naturally follows that there is a great demand for men trained in the art of road building.

City improvement mentioned in another article affords a splendid opportunity to those following this course of study. A few of the many essential features which we might mention, i. e., establishing street and sidewalk grades, cross-sectioning and computing earthwork, laying out street and alley intersection, installation of sewers and accessories, inspection, specification, advertisements, proposals and lettings.

The following is the schedule of the course offered showing the number of credit hours per week devoted to each subject:

FIRST QUARTER

College Algebra I.	4
Trigonometry I.	5
Mech. Drawing I.	4
Physics IV.	5
Est. and Cont.	2½

SECOND QUARTER

College Algebra II.	4
Trigonometry II.	2½
Mech. Drawing II.	4
Chemistry II.	3
Anal. Geometry I.	5

THIRD QUARTER

College Algebra III.	4
Calculus I.	4
Mech. Drawing III.	4
Chemistry III.	5
Anal. Geom. II.	3

FOURTH QUARTER

Calculus II.	4
Desc. Geometry I.	4
Physics V.	4
Chemistry VI.	5
Plane Surveying	5

FIFTH QUARTER

Masonry	4
Calculus III.	4
Desc. Geometry II.	4
Physics VI.	5
Municipal Engineering	5

SIXTH QUARTER

Masonry Design	3
Mech. of Materials I.	5
Anal. Mech.	5
Chemistry VIII.	5
R. R. Survey	5

SEVENTH QUARTER

Mech. of Materials II.	5
Irrigation	2½
Stresses I.	5
R. R. Economics and Design	5
Sewerage Design	2½

EIGHTH QUARTER

Geology	3
Water Supply	4
Stresses II.	5
Hydraulics I.	5
Sewerage Disposal	2½

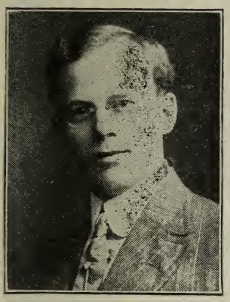
NINTH QUARTER

Higher Structures	5
Graphics I.	4
Hydraulics II.	3
Hydraulic Lab.	2
Highway Engineering	2½
Cement Testing	1
Seminar	1

TENTH QUARTER

Municipal Management	5
Mill Buildings	3
Electric Rys.	2½
Reinforced Concrete	3
Graphics II.	4
Seminar	1
THESIS	

CHEMICAL ENGINEERING



Prof. L. C. Sleesman

In answer to the growing demand for a course of study that will prepare the student to attack and solve the many chemical and metallurgical problems evolving from the rapid development of the industries, a course in chemical engineering has been arranged. The aim is not only thoroughly to acquaint the student with the fundamental principles of chemical science, but to afford him a complete drill in analysis and in the preparation of inorganic and organic products. Although this department is only in its infancy, its growth has been much greater than its founders dared even hope it to be.

FIRST QUARTER

College Algebra I.	4
Trigonometry I.	5
Mech. Drawing I.	4
Physics V.	4
Est. and Cont.	2½

SECOND QUARTER

College Algebra II.	4
Trigonometry II.	2½
Mech. Drawing II.	4
Anal. Geometry I.	5
Chemistry II.	5

THIRD QUARTER

College Algebra III.	4
Calculus I.	4
Mech. Drawing III.	4
Anal. Geometry II.	3
Chemistry III.	5

FOURTH QUARTER

Thermodynamics I.	5
Calculus II.	4
Descriptive Geometry I.	4
Physics IV.	5
Chemistry IV.	5

FIFTH QUARTER

Thermodynamics II.	5
Calculus III.	4
Physics VI.	5
Metallurgy	2½
Chemistry V.	5

SIXTH QUARTER

Mech. of Materials I.	5
Elem. Elect. Mech. I.	5
Scientific Management	4
Chemistry VIII.	5

SEVENTH QUARTER

Mech. of Materials II.	5
Elem. Elect. Mach. II.	5
Elect. Mach. I	5
Chemistry IX.	5

EIGHTH QUARTER

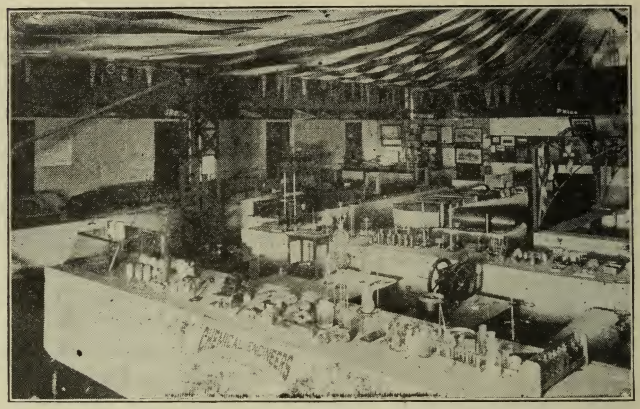
Storage Batteries	4
Hydraulics I.	5
Elect. Mach. V.	5
Chemistry VI.	5

NINTH QUARTER

Mach. Design I.	4
Mech. Lab. I.	4
Hydraulics II.	3
Hydraulic Lab.	2
Graphics	4
Chemistry VII.	5

TENTH QUARTER

Economics I.	5
Steam Engines	4
Electro Metallurgy	2½
Seminar	1
Chemistry X.	5
THESIS	



A FEATURE OF THE ENGINEERS' EXHIBIT

STRUCTURAL DRAFTING

This course is designed to give the students a thorough drill in "Drafting Room" practice. There are many young men who for reasons, financial or otherwise, do not aspire to the longer courses leading to a degree; but who would gladly avail themselves of the opportunity to prepare themselves to enter the busy "Structural Field." For such as these we have arranged this course, and upon completion of same a certificate will be granted, which should prove to be a valuable passport into the modern drafting room. There is no preparation other than the grades necessary to enter this course.

FIRST QUARTER

Algebra I.	4
English Composition	5
Mechanical Drawing I.	4
Geometry I.	5

SECOND QUARTER

Algebra II.	4
Geometry II.	5
Preparatory Rhetoric I.	5
Mechanical Drawing II.	4
Physics I.	5

THIRD QUARTER

Algebra III.	4
Geometry III.	5
Mechanical Drawing III.	4
Descriptive Geometry I.	4
Business English	4

FOURTH QUARTER

Algebra IV.	4
Machine Drawing	4
Descriptive Geometry II.	4
Graphic Statics	4
Trigonometry I.	5

DESCRIPTION OF COURSES

MATHEMATICS

1. College Algebra I. Special stress is laid on factoring, radical quantities, fractional exponents, the solution of simple equations of one, two or more unknown quantities and the quadratic of one unknown. Text: Fine Advanced Algebra. Prerequisite Alg. II. and III.

2. College Algebra II. The large part of this course is a study of the quadratic equation, followed by the surds, complex numbers, the binominal theorem, convergency and divergency of series, and arithmetric, geometric and harmonic series. Text: Fine Advanced Algebra. Prerequisite: College Alg. I.

3. College Algebra III.: An exposition of the theory of logarithms; permutations, combinations, probability, determinants; theory of equations. Text: Fine Advanced Algebra. Prerequisite: College Alg. II.

4. Trigonometry I.: (Plane). This course includes the theory of the trigonometric functions and their application to the solution of right and oblique plane triangles; the use of tables; the solution of a large number of practical problems. Text: Palmer & Leigh. Prerequisite: Alg. III. & Plane Geometry.

5. Trigonometry II. Includes a study of the theory of trigonometric complex numbers, Demoivre's theorem, trigonometric series, spherical trigonometry and its application to Astronomy. Text: Palmer & Leigh. Prerequisite: Trig. I. & Solid Geometry.

6. Analytic Geometry I. The properties of the straight line referred to Cartesian and polar coordinates, loci, equations, and tangent to the circle, the parabola, the ellipse and the hyperbola. Text: Smith & Gail. Prerequisite: Trig. I.

7. Analytical Geometry II. A study of the conic sections, poles and polars, higher plane curves, solid geometry embracing the plane and quadric surfaces. Text: Smith & Gail. Prerequisite: Analytics I.

8 Calculus 1. (Differential). Functions: their differentiation ,expansion, maxima and minima, together with indeterminate forms. Text: Osborne. Prerequisite: Analytics I. & Trig. I.

9. Calculus II. A study of the points of inflexion, curvature, evolutes and involutes, change of the independent variable, functions of two or more variables, and the simpler forms of integration. Text: Osborne. Prerequisite: Calculus I. & Anal. Geometry II.

10. Calculus III. (Integral) Integration and its application in determining length and areas of curves, surfaces, and volumes of solids of revolution; The applications of ordinary differential equations to mechanics. Text: Osborne. Prerequisite: Calculus II.

11. Differential Equations. Equations of first and second orders; linear, with constant and with variable coefficients; hypergeometric series; equations involving more than two variables; partial differential equations of the first and higher order. Text: Johnson. Prerequisite: Calculus III.

12. Analytic Mechanics I. A study of con-current and non-current forces, centroids of areas, couples, moments of inertia, flexible cords, and motion in a straight line. Text: Smith & Langley, Prerequisite: Calculus III.

13. Analytic Mechanics II. Motion, curvilinear and rotary; work and energy; friction; dynamics of rigid bodies, and impact. Text: Smith & Langley.

14. Least Squares. A study of the law of probability of error and the adjustment and precision of observation. Text: Merriman. Prerequisites: Algebra III. and Calculus III.

15. History of Mathematics. Mathematics of antiquity. the middle ages, the awaking of Modern Europe, the origin of modern Geometry, Mathematics of recent times and history of applied Mathematics. Text: Cajori. Prerequisite: Calculus III.

PHYSICS AND CHEMISTRY

4. Physics IV.: (University Physics—Mechanics): Kinematics, kinetics elasticity, mechanics of fluids, lectures, class exercises and laboratory work. Prerequisites: Physics I., II., and III.

5. Physics V.: (University Physics—Sound, Heat and Light): Nature and motion of sound ,theory of music, nature and propagation of light, refraction, dispersion and polarization, nature of heat, temperature, expansion, fusion, kinetic theory of gases. Text: Reed & Guthie. Prerequisites: Same as in Physics IV.

6. Physics VI.: (University Physics—Magnetism and Electricity): Electrical charges, potential capacity, electrolysis, Ohm's law, electrodynamics, electromagnetism, electro-magnetic induction, electric oscillations. Lectures and class exercises. Text: Reed & Guthie, Prerequisites: Physics IV.

7. Chemistry II.: This is a course in the non-metallic elements and their inorganic compounds. The class work consists of lectures, recitations and demonstrations. In individual laboratory work, each student thoroughly investigates every subject. Text: McPherson and Henderson. Prerequisite: physics I., II., III., Algebra I.

8. Chemistry III.: In this course the metallic elements. their compounds and chemical philosophy are theoretically and practically taught by lectures, recitations, demonstrations and much individual laboratory work by the student. Text: McPherson and Henderson. Prerequisite: Chemistry II.

DRAWING

1. Freehand Drawing: Sketches and pencil work.

2. Mechanical Drawing I.: Use of drawing instruments. cabinet and isometric projections, working drawings. Text: French's Engineering. Drawing. Prerequisites: Freehand drawing, geometry, lettering.

3. Mech. Drawing II. Orthographic projections, intersections, shadows, elementary linear perspective. Text: French's Engineering Drawing. Prerequisites: Mechanical Drawing I.

4. Mech. Drawing III. Angular, parallel, vertical, curvilinear and perspective shades and shadows. Text: French's Engineering Drawing. Prerequisites: Mechanical Drawing II.

5. Descriptive Geometry I.: Advanced orthographic projection planes, single and double curved surfaces. Text: Church's Descriptive Geometry, Prerequisites: Projections.

6. Descriptive Geometry II.: Spherical projections, maps shadows, perspectives. Text: Church's Descriptive Geometry. Prerequisites: Descriptive Geometry I.

7. Machine Drawing: Drafting room practice, conventions, detailing, assembly drawing, checking. Text: Reid's Machine Drawing and Elementary Machine Design. Prerequisite: Mechanical Drawing III.

9. Masonry Design: Intersecting arches, warped surfaces. etc. modeling and drawing. Text: Professor's Notes. Prerequisite: Descriptive Geometry.

CIVIL ENGINEERING

1. Plane Surveying: Chain, compass, level and transit use. Text: Pence and Ketchum's Manuel of Surveying. Prerequisite: Trigonometry.

2. Field Engineering: Land, topographical, stadia and city surveying. Drawing room—platting, blue printing and tinting. Text: Smith & Johnson. Prerequisites: Plane Surveying.

3. Railroad Surveying: Reconnaissance, preliminary and mathematics of curves. Text: Searle's Field Engineering. Prerequisite Field Engineering.

4. R. R. Economics and Design. Location, maintenance and economics. Text: Wellington's Economic Theory of Railway Location and Talbot's Transition Curves. Prerequisite: Railroad I.

5. Highway Engineering. Location and construction of streets and pavements. Text: Baker's Roads and Pavements. Prerequisites: Field Engineering.

6. Structural Geology: A study of the earth's crust, dealing with rock form and structure, and the formation of mineral deposits and mountains. Text: Chamberlain and Salisbury. Prerequisites. Physical Geography, Chemistry and Physics.

7. Sewerage: Disposal and design. Text: Fowell's Sewerage. Prequisites: Chemistry and Surveying.

8. Irrigation: History, methods of installation, cost. Text: Bowie's Irrigation. Prerequisites: Physics and Sewerage.

9. Hydraulics I.: Hydrostatic and hydromechanic pressures. Text Merriman's Hydraulics. Prerequisites: Physics and Calculus.

10. Hydraulics II.: Hydraulic machinery. Text: Merriman. Prerequisite: Hydraulics I.

11. Astronomy: Study of the celestial spheres. Class exercises and laboratory. Text: Moulton. Prerequisites: Calculus.

12. Field Astronomy: Observation and computation. Text: Comstock. Prerequisite: Astronomy.

13. Geodesy: Geodetic surveying and map making. Text: Merriman. Prerequisite: Least Squares and Field Astronomy.

14. Masonry: Properties and uses of sand, brick, lime and cement. Text: Baker's Masonry Construction. Prerequisite: Geology, Mechanics.

15. Foundation and Retaining Walls: Foundations, dams, retaining walls, culverts, arches Text: Baker. Prerequisite: Masonry.

16. Mechanics of Materials I. and II.: The course in Mechanics of Materials takes up work in elastic and ultimate strength of materials and treats of the simple stresses which may come upon materials. This is followed by elastic and ultimate deformations. This carries the student into a further discussion of the resistance and elasticity of materials, the theory of beams, continuous girders, columns and shafts. The course also includes a discussion of the resilience, combined and true stresses, and elements of the mathematical theory of elasticity Text: Merriman's Mechanics of Materials Prerequisites: Higher Mathematics.

17. Stresses I. and II.: Roofs and bridges. Text: Merriman's Bridge I. Prerequisites: Higher Mathematics and Mech. of Matts.

18. Grapics I and II.: Roofs and bridges. Text: Merriman's Bridges II. Prerequisite: Higher Mathematics.

19. Higher Structures: Cantilevers, swing bridges, arches, suspension bridges. Text: Merriman's Bridge IV. Prerequisite: Stresses and Graphics.

20. Bridge Design I.: Roofs trusses and plate girder bridges. Text: Merriman's Bridge III. Prerequisites, Stresses and Graphics.

21. Bridge Design II.: Complete design of simple trusses and special bridges. Text: Professor's Notes. Prerequisites: Bridge Design I.

22. Building Construction: Computation of Stresses and design of modern structures. Text: Ketchum's Mill Buildings. Prerequisites: Stresses and Graphics.

23. Reinforced Concrete: Bridges, building, and kindred structures. Text: Taylor and Thompson. Prerequisites: Calculus, Masonry.

24. Water Supply: Design, construction, maintenance. Text: Folwell. Prerequisite: Physics, Chemistry and Field Engineering.

25. Cement Laboratory: Test for fineness, specific gravity, time of set, tensile and compressive strength, et cetera. Text: Waterbury. Prerequisite: Masonry.

26. Hydraulic Laboratory: Test for water transportation losses. Text: Professor's Notes. Prerequisite: Hydraulics I. and II.

27. Highway Laboratory: Test for absorption, crushing, impact, and abrasion of road materials. Text: Professor's Notes. Prerequisites: Chemistry I., II., III., Physics IV., Highway Engineering.

ELECTRICAL ENGINEERING

1. Elementary Electric Machinery I: For M. E. and C. E. students, for first year E. E. students. D. C. Generators and Motors, Train Lighting, Storage Batteries. Text: Gray's Principles and Practice of Electrical Engineering. Prerequisites: Plane Trigonometry; Physics VI. for M. E. and C. E. Students.

2. Elementary Electric Machinery II: Continuation of course 1. Alternating current circuits, alternators, transformers, induction motors, transmission, illumination. Text: Gray's Principles and Practice of Electrical Engineering. Prerequisite: Elementary Electric Machinery I.

3. Electric Machinery I: (D. C. Generators) Physical theory, construction, magnetization curve, reactions, windings, operating characteristics, Problems. Text: Langsdorf's Principles of Direct Current Machines. Prerequisites: Elem. Elec. Machinery I., Calculus I.

4. Electric Machinery II. (D. C. Motors) Commutation, reaction, efficiency, rating, heating, problems. Text: Langdorf's Principles of Direct Current Machines. Prerequisites: Electric Machinery I.

5. Electric Machinery III: (D. C. Laboratory): Experimental work with direct current instruments, circuits, generators and motors. Text: Wilson's Dynamo Laboratory Outlines. Prerequisites: Electrical Machinery I., II.

6. Electric Machinery IV.: (D. C. Design) Critical study of the direct current generator with special reference to design, design of a large direct current generator. Text: Gray's Electrical Machine Design. Prerequisites: Electrical Machinery I., II.,

7. Electrical Machinery V.: Theory of alternating current circuits. (Six weeks). Text: Sheldon's Alternating Current Machinery, Vol. II. Problems. Alternating current circuits (six weeks) Lyon's Problems in Electrical Engineering. Prerequisites. Elem. Elect. Mach. II., Elect. Mach. I., II

8 Electrical Machinery VI: (Transformers) Theory and operation (Electrical transmission) high and low tension transmission, construction and costs. Texts: Sheldon's Alternating Current Machinery Vol. II., Taylor's Transformer Practice, Still's Electric Transmission. Prerequisite. Electric Mach. V. Mach. V.

9. Electric Machinery VII.: (A. C. Alternators, A. C. Motors, Sychronous and Induction) Theory, construction, diagrams, design. Text: Baily's Induction Motors, Sheldon's Alternating Current Machinery Vol. II. Prerequisite: Elec. Mach. V.

10. Electric Machinery VIII.: (A. C. Design): Design of an Alternator. Text: Gray's Electrical Machine Design. Prerequisite: Electric Machines VII.

11. Electric Machinery IX.: (a) (A. C. Laboratory) Resistance, capacity, induction in A. C. circuits Lectures, problems. Text: Wilson's Dynamo Laboratory Outlines. Prerequisites: Electric Machinery VI. and VII.

12. Electrical Machinery IX.: (b) (A. C. Laboratory) A. C. Machines, Tests on sychronous machinery. Lectures, problems. Text: Wilson's Dynamo Laboratory Outlines. Pre requisites: Electric Machinery IX.-a.

13. Alternating Currents: Advanced theory, vector analysis, complex notation. Problems. Texts: Bedell and Crehore's Alternating Currents. Lyon's Problems in Electrical Engineering. Prerequisite: Electric Mach. VI., VII.

14. Electric Railways: Traffic studies, surveys, probable earnings, construction, heavy main line electrification. Hardings Electric Railway Engineering, Current Periodicals. Prerequisites: For C. E. students Elementry Electric Machinery I., for E. E. students Electric Machinery VI. and VII.

15. Electric Circuits: The more difficult A. C. circuits. Problems. Text: Karapetoff's Electric Circuit. Prerequisites: Electric Machinery VI. and VII.

16. Electric Meters: Theory, construction, testing, calibration. Text: Jansky's Electrical Meters. Prerequisites: Elementary Electric Machinery II.

17. Storage Batteries: Chemical Theory, construction, boosters. Text: Lyndon's Storage Battery Engineering. Prerequisites: Chemistry II., Electric Machinery II.

18. Telephone Engineering: Circuits, apparatus, central office equipment, cable plant, inspection trip, tests in laboratory. Prerequisites: Physics VI., Elementary Electric Machinery I.

19. Electric Power Plant Engineering: Power plant layouts, switch gear, operation. Prerequisites: Electric Machinery VI.

MECHANICAL ENGINEERING

1. Thermodynamics I. Theory of heat, laws of dynamics, perfect gases, saturated vapors, superheated vapors. Text: Cardullo's Thermodynamics (First Edition, Impression-corrected.) Prerequisites: Calculus II., First Year Physics.

2. Thermodynamics II. Steam engines, compound engines, engine testing, engine economy, condensing machinery, combustion, boiler plant auxiliaries, water cooling apparatus, compressed air, evaporation and drying, kinetic theory of heat. Text: Cardullo. Prerequisite: Thermodyamics I.

3. Steam Boilers: Types of boilers, flue and fire tube boilers, water tube boilers, boiler calculations, effects of heat, fuels, chemistry of combustion, methods of firing, chimneys and draft, boiler feed waters, inspection and care of boilers, boiler testing. Text: Parsons (Fifth Edition.) Prerequisites: Thermodynamics I.

4. Steam Power Plants.: Elementary steam power plants, coal and ash-handling systems, feed water purifiers and heaters, pumps, piping and pipe fitting, typical modern isolated stations. Text: Gebhardt's Steam Power Plant Engineering. Prerequisites: Steam Boilers, Thermodynamics II.

5. Steam Turbines: Velocity and flow of steam, flow of steam through orifices, turbines, reaction turbines, impulse-reaction turbines. Text: Moyer's Steam Turbines. Prerequisite: Thermodynamics II.

6. Gas Engines: Liberation of heat energy, combustion, gas engines burning gas, gas engines using kerosene oil, gas engines using gasoline, automobile engines, ignition, carburetion testing. Text: Streeter's Internal Combustion Engines. Prerequisite.: Thermodynamics II.

7. Gas Engine Design: Inertia of reciprocating parts, net effort diagrams, rotative effort diagrams, weight of flywheel. construction of flywheel, velocity and displacement diagrams, cylinders, cylinder covers, frames, valves, valve gears, the crankshaft. Text: Streeter's Internal Combustion Engines. Prerequisites: Gas Engines.

8. Mechanical Laboratory I. Laboratory work in heat measurements, determination of moisture in steam, measurements of areas, engine indicators and reducing motions, measurement of power, calorific value of fuels. Text: Moyer's Plant Testing. Prerequisites: Thermodynamics II.

9. Mechanical Laboratory II. Steam and gas engine tests. power plant tests, methods for correcting steam engine and steam turbine tests to standard conditions, flue gas analysis. Text: Moyer's Power Plant Testing. Prerequisite: Gas E ngines.

10. Machine Design I: Mechanisms, motion and velocities, kinematic chains, instantaneous centers, velocity diagrams, parallel and straight line motion, cams, gearing, bevel gears, gear trains, belting, intermittent motions. Text: Sibley's Pure Mechanism. Prerequisites: Machine Drawing.

11. Machine Design II: Materials frames, cast iron beams. wheel rims, cylinders, helical springs, journal bearings, roller bearings, punch and shear details Text: ,Benjamin and Hoffman's Machine Design. Prerequisite: Machine Design I.

12. Machine Design III: Study of the toggle-joint press alternate designs, vertical hand-power press, vertical foot-power-press, small hand-power press, hand-power punch and shear, belt driven punch and shear. bevel shear, the bulldozer, sheet metal flanger and disc cutter, Moyer's air hoist, riveters, Text: Benjamin and Hoffman's Machine Design. Prerequisite: Machine Design II.

13 Metallurgy: Properties of metals, processes and apparatus, mechanical metallurgical operations, ores, ore crushing, the roasting of ores, metallurgical operations, gases, air supplies. Text: Rhead's Metallurgy. Prerequisite: Chemistry II.

14. Heating and Ventilating: Heat, heat losses from buildings, different methods of heating, properties of steam, radiators, steam boilers, steam heating systems, pipe, fittings, valves and accessories steam piping, hot-water systems, automatic temperature control, air and its properties, ventilation, hot-air furnace heating, design of fan systems airwashers and air conditioning, fan systems for various types of buildings, central heating. Text: Allen and Walker's Heating and Ventilation. Prerequisite: Thermodynomics II.

15. Valve Gears: Valve diagrams, use of valve diagrams, port openings, passage areas forms of slide valves, shaft governors, valve setting, design of slide valves with riding cut-off, pump valves, reversing gears, corliss valve gears, poppet valve gears. Text: Fessenden, Valve Gears. Prerequisite: Machine Design II.

16. Steam Engine Design: Design of ports, cylinders, connecting rods, expansion ratios, receivers, multiple expansion engines, tandem compound cross compound, three cylinder compound angle compound, duplex compound, Wolff compound, engines. Text: Klein's Design of a High Speed Engine. Prerequisite: Thermodynamics II. Machine Design II.

17. Refrigeration: Cold and its production, commercial systems of refrigertion, compression systems, ice making systems, the installation and operation of refrigerating system, capacity of refrigerating machines, cold storage duty. Text: Greene: The Elements of Refrigeration. Prerequisite: Thermodynamics II.

18. Machine Shop: Screw threads, cutting screw threads, pipe and pipe threads, twist drills and taps, calipering and fitting, standard jig parts, horsepower, belts and shafting, steam hammers and drop forging, dictionary of shop terms. Text: Colvin and Stanley. American Machin st's Handbook.

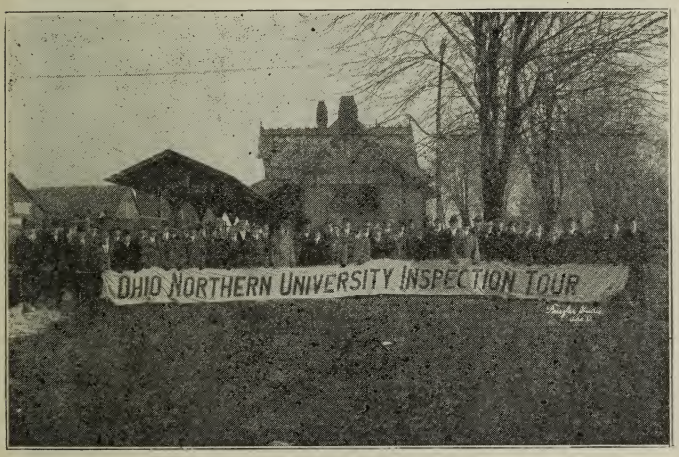
ANNUAL INSPECTION TRIP

The Senior Class as a whole devotes one week to an extended visit to some large commercial center. This year's class visited Chicago, Gary and Ft. Wayne, when every minute was profitably spent in the study of the various phases of Engineering practice. Next year's class will spend the week among the industries of Pittsburgh and vicinity, during the last week in February.

POSITIONS

Our experience in the past has been that the demand made upon the College of Engineering for graduates has been far in excess of the supply. Many employers insist on us granting concessions whereby our men can get away at the very earliest moment to report for duty. The question is asked us sometimes whether we guarantee to secure positions for our graduates. This question we must answer in the negative, as no responsible school can afford to make such a guarantee.

There is not to our knowledge, a single graduate (since the department was founded) that is not holding a good position.



COLLEGE OF ENGINEERING
CLASS OF 1920

Quigley, R. L. _____Pres. Keadey, H. W. ____Vice Pres.
Long, R. E. _____ Sec. Moon, A. J. _____ Treas.
Reynolds, C. E. _____ Reporter

CIVIL

Lane, Eric D. __ Columbus, O.
Williams, J. A.__ Granville, O
Stamm, E. P. Sharpsburg, Pa.
Huff, T. C. _____ Findlay, O.
Cordero, L. F._Columbia, S. A.
Kemal, A. ____
___ Constantinople, Turkey
Gordon, A. F. __ Cleveland, O.
Moon, A. J. __ Centerville, O.
Gerold, H. F. _____ Elyria, O.
Mirza, J. J. ___ Urmia, Persia
Corbett, J. J. _____ Ada, O.
McLean, L. G._Jefferson, S. C.
Keadey, H. W._Centerburg, O.
Miller, C. M._____Akron, O.
Campello, M. ____Brazil, S. A.
Burnside, C. B. Mt. Victory, O.
Netto, O._____Brazil, S. A.
Maurer, M. H.____Malvern, O.
Steese, A. R._____Canton, O.
Leininger, R._____
__ Sinking Spring, Pa.
Tavares, O. _____Brazil, S. A.
Pugh, R. D. ____Arlington, O.
Sih, L. _____ Sinfu, China

ELECTRICAL

Saramango, J. R._Brazil, S. A.
Quigley, R. L.___ Chardon, O.
Moses, M. S. _____Malvern, O.
Long, R. E _____ Lake, O.
Rowand, A. M. Springfield, O.
Beatty, L. D. _____ Greer, O.
Bochenek, D.M. Elizabeth, N.J.
Downing, J.D. Belle Center, O.
Zimmerman, M. J.___ N. Y. C.
Alves, O.F. _____ Brazil, S. A.
Berry, O F._____ Geneva, O.
Lynde, W. L.____ Marlboro, O.
Jepson, M._ Little Valley, N.Y.
Selpien, C. _____ Ada, O.
Elder, M. V. _____ Ada, O.
Sarisky, J.A._ Youngstown, O.
Robinson, H. H.____Findlay, Ohio

MECHANICAL

Hecox, L.C. _____ Ada, O.
Rice, E.C. New Philadelphia,O.
Gilbreth, G. E. ____Marion, O.
Silverman, H.H.___ Geneva, O.
Swihart, H.M.___ Brewster, O.
Bargman, B.B.__ Millville, Pa.

CHEMICAL

Weinberg, J. New York, N.Y.
Seely, C. M.____ Berwick, Pa.
Marshall, Wm._ Carrollton, O.
Reynolds, C. E. ____
_____Troupsburg, N. Y.
Hunter, J. S. _____ Gastonia, N. C.

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